FACT SHEET 60

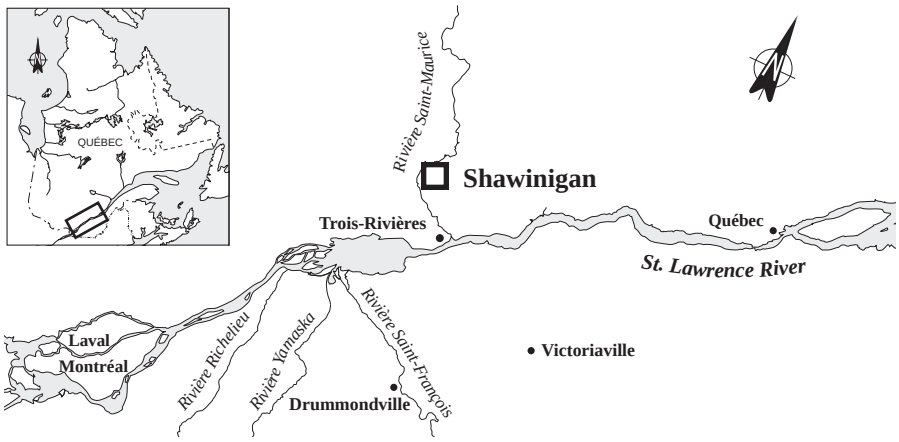
Alcan Smelters and Chemicals Ltd, Shawinigan Works

1100 Saint-Sacrement Blvd.
Shawinigan, Quebec
G9N 6W4

A list of 106 industrial plants has been established under St. Lawrence Vision 2000 (SLV 2000), the second phase of the St. Lawrence Action Plan, launched in 1988. The overall objective is to reduce toxic effluent and virtually eliminate discharges of persistent toxic substances.

The 106 industrial plants designated under SLV 2000 are divided into four groups, each with a specific objective. The ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS, located in Shawinigan, is in Group 1 which comprise plants whose effluent may contain toxic substances even though it is treated.

The objective for Group 1 is to reduce toxic effluent discharges in targeted plants by 90%.



INDUSTRIAL PLANT

Aluminum smelter

The ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant uses an electrolysis process that reduces alumina to aluminum using Söderberg-type anodes with horizontal studs; the production capacity of the process is 84 000 t/yr. Gases emitted are recovered using wet scrubbers. The four-stage aluminum casting line includes a retention furnace, alloy furnace, and facilities for oxidation of impurities and ingot casting. The plant also has an annual production capacity of 18 000 t of liquid alum. The alum process used is a chemical reaction of aluminum hydrate with water and sulphuric acid. The plant produces briquette of anode paste which contains a mixture of pitch and coke. The annual briquette production capacity is 100 000 t. In 1995, the plant operates at 100% of capacity and employs a work force of 571.

PRODUCTION

PRINCIPAL RAW MATERIALS

- Alumina
- Coke
- Pitch
- Sulphuric acid
- Hydrates
- Metals for alloys (chromium, copper, iron, magnesium, manganese)

FINISHED PRODUCTS

- Söderberg paste briquette
- Aluminum ingots
- Liquid alum

TREATMENT MEASURES

INITIAL EFFLUENT VALUES

Fluorides and aluminum

Based on company data, in 1993 the plant had effluent discharges of 6694 m^3/d, containing notably:

- 125.5 kg/d of suspended solids (SS)
- 10 kg/d of oil and grease (O&G)
- 5.5 kg/d of fluorides
- 3 kg/d of aluminum

RESOURCES AND USES TO PRESERVE

Resort areas

Effluents from the ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant is discharged into the Saint-Maurice River. A marina, a government wharf, and resort and recreation areas are located not far from the discharge point. The area is used for sport fishing and pleasure boating. The region includes the Parc des Chutes, providing a panoramic view of the Shawinigan Falls and the Saint-Maurice River. The city of Shawinigan has built an urban park and walkway along the river, a little over a kilometer from the effluent discharge point. Some twenty species of fish live in the Saint-Maurice River, including yellow walleye, northern pike and small-mouth bass. The river is also used by waterfowl and swimmers, and contains many spawning areas. Trois-Rivières takes its drinking water from the Saint-Maurice River, about 7 km from where it meets the St. Lawrence River.

ENVIRONMENTAL DISCHARGE OBJECTIVES

Environmental protection

Environmental discharge objectives are established to preserve local resources and uses. These guidelines, expressed as maximum permissible loads and concentrations for effluent released into the environment, are used in choosing treatment methods which best promote environmental protection. The water quality based objectives for ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS have been calculated and are available on request.

EFFLUENT TREATMENT

Water recirculation

Wastewater from the wet scrubbers is treated by addition of lime, allowed to settle and then recycled, while the sludge is dried. Direct cooling water from the casting process is discharged untreated into the municipal sewerage system. Indirect cooling water from electrical rectifiers is air-cooled in a pond and then recycled. Runoff is separated and discharged into the Saint-Maurice River. Domestic sewage is separated then discharged into the municipal sewerage system.

PREVENTION AND CLEANUP MEASURES IMPLEMENTED

Restoration of sedimentation basin site

Wastewater from the alum and anode paste plants has been recirculated in a closed circuit since September 1992. In the fall of 1995, the plant completed a comprehensive site restoration program. The project involved covering the old wet scrubber settling pond with an impermeable membrane and plant cover, and installing a (soil-bentonite) barrier to prevent groundwater intake.

The City of Shawinigan sewage treatment plant is scheduled to open in 1998 or 1999. A collector will then intercept municipal sewage. Only Alcan domestic sewage will be discharged to Shawinigan domestic sewage treatment plant (aerated ponds).

REGULATORY COMPLIANCE - WATER COMPONENT

No specific regulations

The ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant is subject to no specific regulations on the wastewater.

POLLUTION ABATEMENT

CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

Mainly total oil and grease

The Chimiotox index gauges the load of all toxic substances present in industrial effluent, using the toxicity factors assigned to each contaminant. It is used, among other things, to monitor discharge trends over the years and determine the toxic contribution of each pollutant (see Table 1).

Table 1 presents data from the characterization carried out in March 1995 for SLV 2000 along with the Chimiotox values estimated from them assuming an effluent flowrate of 5610 m^3/d. Eight substances were selected out of over 120 tested for. Based on these data, total oil and grease represent 54% of the Chimiotox index.

Figure 1 is based on the characterization data collected in 1995. The Chimiotox index calculated from the SLV 2000 characterization data was used as is for 1993 to 1998. No changes have been made to the process nor the industrial effluent treatment system between 1993 and 1995.

Table 1 ***Chimiotox Index (1995) - Alcan Smelters and Chemicals Ltd, Shawinigan Works****

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Total oil and grease	16.143	100	1 614
Benzo(*b+k*)fluoranthene	0.014	32 154	434
Dibenzo(*a,h*)anthracene	0.004	100 000	377
Benzo(a)pyrene	0.003	100 000	297
1,2,3-Indeno(*cd*)pyrene	0.003	32 154	103
Benzo(*a*)anthracene	0.003	32 154	91
Total aluminum	6.963	11	77
Anthracene	0.0005	32 154	15
CHIMIOTOX INDEX			**3 008**

* For an effluent flowrate of 5610 m^3/d (8 substances selected in testing for more than 120).

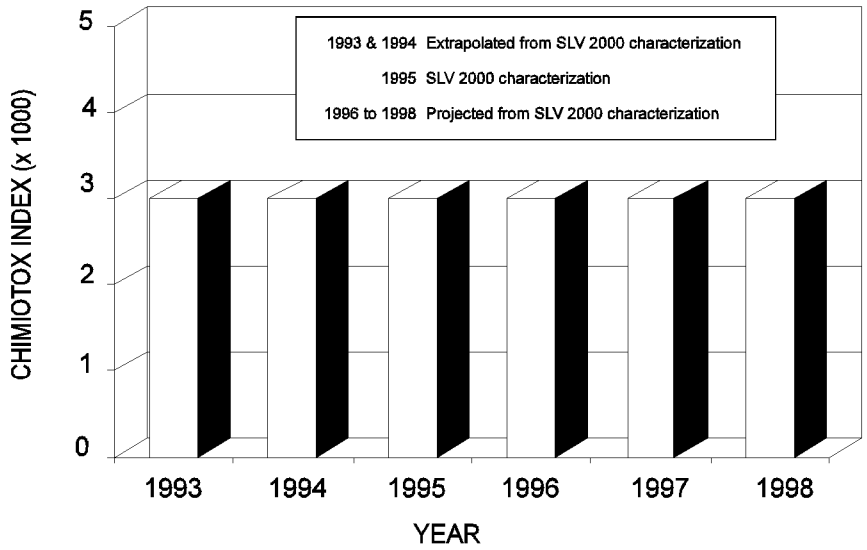


Figure 1 ***Chimiotox Index Trends, 1993-1998 Alcan Smelters and Chemicals Ltd, Shawinigan Works***

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

One long-range objective of SLV 2000 is the virtual elimination of eleven persistent and bioaccumulative toxic substances from the effluent of the 106 targeted plants along the St. Lawrence and its tributaries. The targeted substances are those designated by the International Joint Commission in August 1993: PCBs, DDT, dieldrin, toxaphene, dioxins, furans, mirex, mercury, lead alkyls, benzo(*a*)pyrene and hexachlorobenzene. To reach this objective, Protection has fixed the environmental discharge objectives set for applicable substances as its target by the end of SLV 2000 in 1998, thereby ensuring that all uses of the receiving environment are protected.

During the 1995 SLV 2000 characterization, one persistent toxic substance was found in effluent from the ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS plant: the benzo(*a*)pyrene concentration was 2.81 µg/l. This value meets the environmental discharge objective for polycyclic aromatic hydrocarbons (including benzo(*a*)pyrene), which is 3.1 µg/l.

PEEP TOXICITY REDUCTION

Low toxicity

The Potential Ecotoxic Effects Probe, or PEEP, combines the results of six standardized bioassays measuring the toxic effects of effluent. The results are expressed on a logarithmic scale of increasing toxicity ranging from 1 to 10 and are used to monitor discharge trends over the years. In the case of the ALCAN SMELTERS AND CHEMICALS LTD, SHAWINIGAN WORKS, a series of bioassays was conducted in 1995, resulting in a PEEP value of 2.8, and the toxicity of the effluent to the organisms tested was low.

REDUCTION IN SUBSTANCES MONITORED

Decrease in SS

Based on 1995 company data, the plant discharges 5610 m^3/d of effluent, containing notably:

- 15.4 kg/d of oil and grease (O&G)
- 13.5 kg/d of suspended solids (SS)
- 8.8 kg/d of fluorides
- 4.7 kg/d of aluminum

From 1993 to 1995, the concentration of suspended solids decreased by 89%. This decrease was due to a reduction in atmospheric discharge of particles from the pot-room lines and plant maintenance.

KEY POINTS

- **Recirculation of alum plant water since September 1992**
- **Sedimentation basin site restoration in fall of 1995**

Based on December 1995 inventory

ADDITIONAL INFORMATION

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